

Claims

- [c1] 1. A resistive touch membrane for an operator interface, the membrane comprising:
touch regions for a display window of the operator interface;
a membrane keypad comprising depressible keys; and
a connector system containing electrical connectors extending from the touch membrane;
wherein each touch region is associated with a pair of electrical connectors within the connector system, each key is associated with a pair of electrical connectors within the connector system, and wherein each key shares one electrical connector in common with one of the touch regions.
- [c2] 2. The resistive touch membrane of claim 1 wherein each key is associated with one electrical connector which is not associated with any of the touch regions.
- [c3] 3. The resistive touch membrane of claim 1 wherein electrical connector association of the touch regions and the keys is organized in a combined matrix, wherein association of an electrical connector with a touch region or a key is determined by location of the touch region or key within the combined matrix.
- [c4] 4. The resistive touch membrane of claim 1 wherein the touch regions are divided into an $A \times C$ matrix and the keys are divided into a $B \times C$ matrix, the membrane comprising a combined $D \times C$ matrix for the touch regions and the keys for determining association of electrical connectors, wherein $A + B = D$.
- [c5] 5. The resistive touch membrane of claim 1 wherein the connector system includes a first receptacle and a second receptacle, each receptacle containing a subset of the electrical connectors.
- [c6] 6. The resistive touch membrane of claim 5 wherein each touch region is associated with one electrical connector from the first receptacle and one electrical connector from the second receptacle, and each key is associated with a pair of electrical connectors from the first receptacle.
- [c7] 7. The resistive touch membrane of claim 5 further comprising LED's, wherein

each LED is associated with a pair of electrical connectors from the second receptacle.

- [c8] 8. The resistive touch membrane of claim 1 wherein touching a touch region completes an electrical connection between the pair of electrical connectors associated to that touch region and pressing a key completes an electrical connection between the pair of electrical connectors associated to that key.
- [c9] 9. The resistive touch membrane of claim 1 wherein the keys include 10 dome keys comprising function keys, navigation keys, and editing keys.
- [c10] 10. The resistive touch membrane of claim 1 wherein the touch regions are located within the display window, the display window including an LCD display.
- [c11] 11. The resistive touch membrane of claim 1 wherein each touch region and each key is associated with a distinct pair of electrical connectors not associated with any other touch region or key.
- [c12] 12. An operator interface comprising:
a housing; and,
a resistive touch membrane contained within the housing, the membrane comprising:
touch regions for a display window of the operator interface;
a membrane keypad comprising keys;
a connector system containing electrical connectors;
wherein each touch region is associated with a pair of electrical connectors within the connector system, each key is associated with a pair of electrical connectors within the connector system, and wherein each key shares one electrical connector in common with one of the touch regions.
- [c13] 13. The operator interface of claim 12 wherein each key is associated with one electrical connector which is not associated with any of the touch regions.
- [c14] 14. The operator interface of claim 12 wherein electrical connector association of the touch regions and the keys is organized in a combined matrix, wherein association of an electrical connector with a touch region or a key is determined

by location of the touch region or key within the combined matrix.

[c15] 15. The operator interface of claim 12 wherein the touch regions are divided into an A x C matrix and the keys are divided into a B x C matrix, the membrane comprising a combined D x C matrix for the touch regions and the keys for determining association of electrical connectors, wherein $A + B = D$.

[c16] 16. The operator interface of claim 12 wherein the connector system includes a first receptacle and a second receptacle, each receptacle containing a subset of the electrical connectors.

[c17] 17. The operator interface of claim 16 wherein each touch region is associated with one electrical connector from the first receptacle and one electrical connector from the second receptacle, and each key is associated with a pair of electrical connectors from the first receptacle.

[c18] 18. The resistive touch membrane of claim 12 wherein touching a touch region completes an electrical connection between the pair of electrical connectors associated to that touch region and pressing a key completes an electrical connection between the pair of electrical connectors associated to that key.

[c19] 19. A method of arranging associations between electrical connectors, touch regions, and dome keys of an operator interface, the method comprising:
providing an association matrix, the matrix including rows and columns and a plurality of cells defined by its location within a row and a column;
associating each row with one electrical connector;
associating each column with one electrical connector;
associating each touch region with a cell within the matrix;
associating each dome key with a cell within the matrix; and,
associating each dome key with cells residing in rows containing cells associated with touch regions.

[c20] 20. An industrial management system comprising:
at least one control device;
a programmable logic controller; and,
an operator interface communicating with the at least one control device and

the programmable logic controller, the operator interface comprising:
a housing; and,
a resistive touch membrane contained within the housing, the membrane comprising:
touch regions for a display window of the operator interface;
a membrane keypad comprising buttons;
a connector system containing electrical connectors;
wherein each touch region is associated with a pair of electrical connectors within the connector system, each button is associated with a pair of electrical connectors within the connector system, and wherein each button shares one electrical connector in common with one of the touch regions.

[c21]

21. The industrial management system of claim 20 wherein the connector system of the resistive touch membrane is connected to the programmable logic controller.

Patent 5,922,950